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EXAMINER

SAVAGE, JASON L

ART UNIT	PAPER NUMBER
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1775

DATE MAILED: 07/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/913,006

Applicant(s)

MORICEAU ET AL.

Examiner

Jason L. Savage

Art Unit

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-- **Th MAILING DATE of this communication appears n the c ver sheet with the corresp ndenc address --**
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 21-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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Lack of Unity

1. Claims 1-24 were subject to a lack of unity requirement in Paper No. 6, however, upon review of Applicant's arguments to said lack of unity, it was discovered that the originally filed claims 1-24 are different from the "clean copy" of the claims submitted in Amendment A filed 1-9-02 wherein claims 3 and 24 were amended.

A comparison between the claims shows that originally filed claim 1 does not correspond claim 1 as presented in the "clean copy". Further, there are no claims in the "clean copy" which correspond to original claim 4. Also, there are no claims in the original claims which correspond to claim 23 of the "clean copy" of Amendment A.

Therefore, to clarify the record, the lack of unity has been restated below which is based on the claims as originally filed and amended claims 3 and 24. To be clear, claim 1 is being considered as the claim that was originally filed, not the claim which recites step "C" such as is found in the clean copy.

2. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-20 and 24, drawn to a method.

Group II, claim(s) 21-23, drawn to an article.

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3. The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The claims of Group I contain the special technical feature that the method results in the formation of a determined structure stress. The claims of Group II lacks a corresponding special technical feature that a determined structure stress is formed in the multilayer structure.

4. Applicant's election of Group I with traverse in Paper No. 7 is acknowledged. Applicant argues against the lack of unity requirement by stating that claim 20 depends from claim 1 and thus includes all of the limitations of claim 1. However, this argument is moot since original claim 20 is a method claim which has been grouped with claim 1. Article claim 21 does not depend from claim 1 and thus does not include the limitations of claim 1.

Applicant also states he is unclear as to what technical feature Group II is lacking. As was stated in the lack of unity requirement above, the technical feature contained in Group I is that a determined stress structure is formed in the structure. The structure of Group II has no such determined stress structure and as such, lacks the same corresponding technical feature of the claims of Group I.

Regarding Applicants argument that since the lack of unity was not made in the PCT case a lack of unity does not exist is not persuasive. For the reasons set forth in Paper No. 6 and above, it is believed that a lack of unity is proper.

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Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 is rejected to since it is unclear ^{what} Applicant intends that the adhesion layer is an addition layer separate from the layers recited in claim 1 or if Applicant merely intends that one of the layers recited in claim 1 have a sufficient adhesive property to facilitate assembly of the structure. The claim has been interpreted to mean that no additional layers are required provided that the original layers provide a sufficient adhesive property.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

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(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

8. Claims 1-2, 4, 6, 7, 9-11, 13, 18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakazato et al. (EP 0 410 679).

Nakazato teaches a method for forming a multilayer structure which has first (1a) and second layers (1b) connected through a stacking of at least 2 stress adaptation layers (1c) (Figure 1C). Regarding the limitation that the structure have a determined structure stress, Nakazato teaches multiple instances wherein the stress in the structure may be manipulated (col. 3, ln. 51-56 and col. 4, ln. 32-48) and as such would have a recited structure stress.

Although not presently recited by the claims, regarding the limitation that a heat treatment step adjusts the stress, Nakazato teaches that the structure is heat treated to bond the layers together (col. 2, ln. 18-34). While Nakazato does not teach that such a heat treatment is done in order to adjust the structure stress, the heat treatment would inherently adjust the stresses in the structure in some form.

Regarding claims 4, 6 and 11, Nakazato teaches that the structure is heat treated in a nitrogen containing atmosphere for a time and temperature sufficient to achieve the desired result. Such a heat treatment in a nitrogen containing atmosphere would have formed a molecular bond.

Regarding claim 7, Nakazato teaches first and second layers are prepared by forming the stress adaptation layers thereon prior to molecular bonding.

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Regarding claims 9 and 10, since the adaptation layers are capable of bonding together, they would meet the limitation of being adhesive layers that are capable of bonding the structure together.

Regarding claim 13, the layer (1b) is subject to thinning.

Regarding claims 18 and 20, the silicon oxide stress adaptation layers are formed by oxidizing the silicon substrates (col. 1, ln. 24-35 and col. 2, ln. 12-17).

9. Claims 1-2, 4-18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al. (US 5,854,123).

Sato teaches a method for forming a multilayer structure which has first (41) and second layers (45) connected through a stacking of at least 2 stress adaptation layers (42-44) (Figure 4D).

Regarding the limitation that the structure have a determined structure stress, Sato is silent to the structure having any particular stress structure; however, it does teach that ion implantation of one of the layers which would form a stress structure in the assembly of Sato. Said stress structure is evidence since separation of the assembly can be achieved by a simple heat treatment step (col. 15, ln. 21-26).

Although presently not claimed, Sato's teaching that separation is facilitated by the heat treatment step would meet a limitation that a heat treatment step adjusts the stresses in the structure.

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Regarding claim 4, Sato's teaching that the heat treatment may be done to facilitate separation would be a teaching of performing the treatment for a duration and temperature sufficient to adjust the structure stress.

Regarding claim 5, layer **44** would meet the limitation of an intermediate surmounting stress adaptation layers **42** and **43**.

Regarding claims 2, 6, 8 and 11, Sato teaches that the structure is molecularly bonded together and that it may occur at room temperature (col. 19, ln. 8-13).

Regarding claims 7 and 15, Sato teaches that a ion implantation of a gas is performed prior to the bonding step which forms fracture area **44** (col. 18, ln. 56-67). Such an implantation step would adjust the surface condition of the layers.

Regarding claims 9 and 10, since the adaptation layers as capable of bonding together, they would meet the limitation of being adhesive layers that are capable of bonding the structure together.

Regarding claim 12, Sato teaches a method wherein at least two of the stress adaptation layers (**42**, **43**, **44**) are formed on the first main layer **41** (Figure 4C).

Regarding claims 13-14, layer **44** is subject to thinning by a separation step (Figure 4E). in a nitrogen containing atmosphere for a time and temperature sufficient to achieve the desired result. Such a heat treatment in a nitrogen containing atmosphere would have formed a molecular bond.

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Regarding claim 16, the ion implantation step of Sato affects the structure stress in that it facilitates fraction when the assembly is heat treated (col. 15, ln. 21-26).

Regarding claims 17-18, Sato teaches that the stress adaptation layers can be formed by epitaxial growth, plasma CVD, vacuum CVD, oxidation of the substrate (col. 14, ln. 49-57)

Regarding claim 20, Sato teaches that the main layers may be silicon and the stress adaptation layers may be formed of silicon oxide (col. 19, ln. 1-23).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 3 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US 5,854,123) as applied to claims 1-2, 4-18 and 20 above.

Sato teaches what is set forth above however it does not teach that the stresses in the first and second layers have opposite signs. However, Sato teaches that the structures desirably have a flat structure and uniform thickness (col. 21, ln. 20-57). It would have been obvious to one of ordinary skill in the art at the time of the invention to have taken steps to try and insure the resultant structures were flat, including combining the layers in such a manner as to minimize the

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resulting warpage in the structure. Combining the main layers so that the stresses are opposite in sign would have been an obvious solution to minimizing the warping in the structure.

12. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US 5,854,123) in view of Egloff (US 5,909,627).

Sato teaches what is set forth above however it is silent to a stress adaptation layer being formed by ion implantation of one of the main layers. Egloff teaches a method for forming a multilayer structure which has first (20) and second layers (28) connected through a stacking of stress adaptation layers (24 and 26) (Figure 2). Egloff further teaches that the adaptation layer 24 is formed by ion implantation of main layer 20 (col. 1, ln. 5-12 and col. 3, ln. 13-23).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied the teachings of Egloff of ion implantation of one of the main layers in the method of Sato. One would have been motivated to modify the method of Sato in order to form a stress adaptation layer which could facilitate separation by heat treatment without having to undergo the extra step of forming a porous stress adaptation layer.

Prior Art Made of Record but not Relied Upon

13. The following is a list of prior art made of record but not relied upon in the rejections above:

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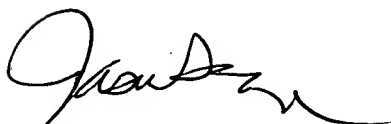
Ohmi et al. (US 6,255,731) teaches a SOI bonding structure which attempts to minimize the affects of warpage on the structure.

Linn et al. (US 5,362,667) teaches that providing dopants in a bonding liquid can result in better stress compensation against warping (col. 3, ln. 5-21). The dopants are diffused into the structure during a heat treatment to effect bonding of the structure (col. 6, ln. 13-39). Linn further teaches that is desirable to closely match the thermal coefficient of expansion of the layers to reduce the stresses in the structure (col. 7, ln. 7-19).

14. Any inquiry to this communication or earlier communications from the Examiner should be directed to Jason Savage, whose telephone number is (703)305-0549. The Examiner can normally be reached Monday to Friday from 6:30 AM to 4:00 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Deborah Jones, can be reached on (703)308-3822.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703)308-2351.


Jason Savage


DEBORAH JONES
SUPERVISORY PATENT EXAMINER

6-25-03